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ABSTRACT

This scope and sequence guide, developed for an auto mechanics vocational education program, represents an initial step in the development of a systemwide articulated curriculum sequence for all vocational programs within the Metropolitan Nashville Public School System. It was developed as a result of needs expressed by teachers, parents, and the business community for sequential structure within the vocational education curriculum. The guide contains an introduction, course description, general course objectives, course content (with specific objectives) in outline format, and a list of resource materials, such as textbooks, curriculum guides, and audiovisual aids. This three-year program is designed to provide experience that will qualify students for entry-level employment in any of the several areas of automobile service. Students are taught to use proper factory approved methods of servicing and repairing the automobile engine, chassis, transmission, differential, electric system, brakes, fuel system, and cooling system. The training also includes learning to make the proper diagnosis using test equipment, precision measuring tools, and service manuals. The course provides students with the opportunity to participate in Vocational Industrial Clubs of America (VICA) leadership training, and in local, state, and national skills competitions. (KC)

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AUTO MECHANICS

SCOPE AND SEQUENCE

VOCATIONAL EDUCATION

U.S. DEPARTMENT OF EDUCATION
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Metropolitan Public Schools

Nashville Davidson County, Tennessee

Charles O. Frazier, Director

FOREWORD

This scope and sequence guide, developed for the Auto Mechanics Vocational Education program, represents an initial step in the development of a systemwide articulated curriculum sequence for all vocational programs within the Metropolitan Nashville Public School System. It is a direct result of needs expressed by teachers, parents, and the business community for sequential structure within the vocational education curriculum. An articulated vocational curriculum allows a student to move from one level of instruction to the next without repeating learning tasks already mastered, and without experiencing gaps in the presentation of relevant instructional material.

A goal of this curriculum effort is to provide teachers a usable guide based on input from the teachers. The initial step was an identification of course content, with all teachers having an opportunity to contribute. What follows is a publication using the teachers' contributions: a sequential listing of objectives and skills for each program offering.

This guide does not include all specific resource materials that may be used to assist students in acquiring minimum competencies. It is to serve as a guide for the sequence of course content and scope of what is to be taught. This guide content is extremely important and its use is encouraged. The suggested competencies and resource materials allow instructors an opportunity to be creative and resourceful in meeting the needs of individual programs and students.

ACKNOWLEDGEMENT

Recognition and appreciation are extended to the following who worked so diligently in the development of these materials:

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INTRODUCTION

The format used in this course is based upon the competency based curriculum guide produced by the Division of Vocational Technical Education for the state of Tennessee. It is hoped that this guide will be used extensively with the Tennessee Automotive Mechanics Curriculum.

This guide is written with maximum flexibility in mind. However, in order to maintain program continuity, it is suggested that any rearranging or variation of unit placement be confined to the semester in which it is listed. Safety and VICA are applicable to each level and semester.

COURSE DESCRIPTION

The Auto Mechanics course of study is designed to provide experience which will qualify the student for entry employment in any of the several areas of automobile service. Students are taught to use proper factory approved methods of servicing and repairing the automobile engine, chassis, transmission, differential, electric system, brakes, fuel system and cooling system.

Training also includes learning to make the proper diagnosis using test equipment, precision measuring tools and service manuals. Skills and attitudes are developed that will produce safe and efficient work habits.

Students have the opportunity to participate in Vocational Industrial Clubs of America (VICA) leadership training and in local, state and national skills competition.

GENERAL COURSE OBJECTIVES

1. To teach safety procedures in the area of automotive mechanics
2. To teach proper care and use of tools and equipment used in automotive mechanic occupations
3. To teach basic skills in automotive mechanics for entry into industry and/or postsecondary education
4. To teach good work attitudes toward employers and fellow workers
5. To provide vocational counseling and job placement services
6. To explore present and future career opportunities in the automotive service industry
7. To improve the public image of vocational education in general and auto mechanics programs in particular
8. To eliminate sex bias and stereotyping in automotive mechanics programs
9. To provide equal opportunities for all individuals who desire to enroll in auto mechanics programs

COURSE CONTENT FOR AUTO MECHANICS I

(First Semester)

I. Orientation (2 weeks)

Specific objectives:

To become familiar with school and shop procedures
To become familiar with rules of safety and conduct
To practice the rules of shop safety
To pass a shop safety test with 100 percent accuracy
To become exposed to the objectives and goals of VICA
To participate in Vocational Industrial Clubs of America (VICA)

A. Understands school rules

B. Understands shop rules

C. Understands safety rules

D. Understands VICA (1 week)

E. Understands purpose and history of VICA

F. Participates in VICA contests

II. Automotive shop skills (10 weeks)

Specific objectives:

To learn the proper use of hand tools and shop equipment
To develop the ability to perform basic auto shop skills

A. Learns use of basic hand tools

B. Learns use of precision measuring tools

C. Learns use of fastners and torque wrenches

D. Learns use of gaskets, sealants, and seals

E. Learns use of tubing and hose

II. **Automotive shop skills continued:**

F. Selects and practices wire and wiring

G. Utilizes holding fixtures

H. Practices soldering, brazing and welding

I. Practices cleaning equipment

J. Practices using major automotive equipment

III. **Automotive brakes (6 weeks)**

Specific objectives:

To understand principles and explain brake history
To identify brake system, component and function
To disassemble, inspect, repair and reassemble brake system

A. Learns principles of operation of brakes

1. Friction
2. Energy
3. Temperature

B. Studies parts and function of the system

1. Linings
2. Drums
3. Cylinder
4. Rotors
5. Pads
6. Bearings

C. Practices disassembly, inspection, and repair of brake system

COURSE CONTENT FOR AUTO MECHANICS I

(Second Semester)

I. **Suspension system (4 weeks)**

Specific objectives:

To learn the basic functions of the springs and shocks
To be able to replace shocks, springs and bushings

A. Learns functions of springs, bushings and shocks

B. Practices replacement of different spring types

1. Coil

2. Leaf (bar)

C. Practices replacement of bushings

D. Practices replacement of shocks

II. **Lubricating system (1 week)**

Specific objectives:

To understand the function and components of the lubrication system
To be able to perform all types of lubricating service

A. Understands function of cooling system

B. Studies components

D. Learns types of oils and lubricants

E. Practices vehicle lubrication

III. **Engine cooling system (1 week)**

Specific objectives:

To learn the function of the complete cooling system
To perform pressure tests and repair cooling system problems

A. Learns cooling theory and components

III. **Engine cooling system continued:**

B. Performs tests and repairs

IV. **Fuel system (6 weeks)**

Specific objectives:

To become familiar with the basic principles of the fuel system
To be made aware of the six major carburetor circuits
To learn to safely rebuild the carburetor
To learn the different types of fuels
To become familiar with engine knocking caused by fuel

A. Learns principles of fuel system

B. Studies components of the system

1. Fuel tank and vents
2. Fuel gauge
3. Fuel pump and filters

C. Studies carburetor circuits

1. Carburetor float
2. Idle and low speed
3. High speed
4. Power
5. Accelerator
6. Choke

D. Studies types of automotive vehicle fuels

1. Gasoline
2. Diesel
3. Liquified petroleum gas

E. Rebuilds carburetors

V. Electrical system (6 weeks)

Specific objectives:

To become familiar with the operation of the electrical system
To learn to perform tests on the electrical system
To learn to repair the electrical system

A. Understands and services the charging system

1. Principles of operation

a. Ohms law

b. Volts, amps, current, resistence

c. Battery

d. Terminals, belts, connections

2. Components

a. Diodes

b. Rotor

c. Stator

d. Regulator

e. Brushes

3. Tests and repairs

B. Understands and services the starting system

1. Principles of operation

2. Diagnosis

3. Battery tests

a. Condition

b. Charging rate

4. Starter tests

B. Understands and services the starting system continued:

5. Repairs

C. Studies and inspects the ignition system

1. Principles of operation

2. Prerequisites for servicing

a. Trained mechanics

b. Proper test equipment

c. Accurate specifications

d. Specific procedure

e. Quality parts

3. Tune-up procedure

4. Services to be performed

a. Inspect

b. Test

c. Clean or replace

5. Nomenclature of the ignition system (3½ weeks)

6. Primary circuit (low voltage)

a. Battery

b. Ignition switch

c. Starter circuit

d. Ballast resistor

e. Ignition coil

f. Distributor

g. Condenser

C. Studies and inspects the ignition system continued:

7. Secondary circuit (high voltage)

a. Coil

b. Coil wire (high tension)

c. Rotor

d. Distributor cap

e. Spark plug cables

f. Spark plugs

COURSE CONTENT FOR AUTO MECHANICS II

(First Semester)

I. **Orientation and review (1 week)**

Specific objectives:

To review school and shop procedures
To review rules of shop safety
To participate in VICA activities

A. Reviews school procedure

B. Reviews shop procedure

C. Reviews shop safety

D. Participates in VICA activities

II. **Engine construction, principles of operation and engine overhaul (11 weeks)**

Specific objectives:

To become familiar with engine construction
To understand the principles of engine operation
To perform engine overhaul

A. Studies engine construction

B. Learns principles of engine operation

1. Cooling system

2. Lubricating system

3. Electrical system

4. Exhaust system

5. Fuel system

C. Performs engine overhaul

1. Cleaning

C. Engine overhaul continued:

2. Inspection/diagnosis

3. Disassembly

4. Replacement

5. Servicing

6. Reassembly

7. Engine parts identification

8. Measurements

III. **Standard transmission, overdrive, drive line and clutch (6 weeks)**

Specific objectives:

To become familiar with the operation of the standard transmission
To diagnose and repair transmission
To become familiar with the operation and parts of the overdrive
To diagnose and repair the overdrive
To become familiar with the purpose of the drive shaft
To learn to replace U-joints
To understand the purpose and operation of the clutch
To diagnose and repair the clutch

A. Understands principles of operation of standard transmission

B. Diagnoses and repairs standard transmission

1. Design of transmissions

2. Clutch or pilot gear

3. Counter gear

4. Gear ratio

5. Changing gears

C. Understands and services overdrive (½ week)

1. Operation and components

2. Planetary gear units

C. Understands and services overdrive continued:

3. Method of providing overdrive

4. Method of changing gears

D. Services drive line (1 week)

1. Drive shaft

a. Types

b. Problems

2. U-joints

a. Types

b. Servicing

D. Services clutch (1½ weeks)

1. Purpose

2. Operation

3. Pressure plate

4. Disk

5. Release bearing

6. Adjustment

COURSE CONTENT FOR AUTO MECHANICS II

(Second Semester)

I. Rear axle and transaxle (7 weeks)

Specific objectives:

To understand the operation of the rear axle and transaxle
To understand gear ratio
To learn to make rear axle and transaxle repair

A. Understands principles of operation

B. Services ring gear and pinion

C. Services axle gears

D. Services side pinion or spider gears

E. Services bearings pinion

F. Services bearings carrier

G. Services bearings axle

H. Services seals

I. Studies gear ratio

J. Adjusts rear axle gear and services transaxle

II. Automatic transmission (3 weeks)

Specific objectives:

To understand the mechanical principle of the hydraulic system
To perform limited repair on automatic transmissions

A. Understands principle of operation

B. Maintains fluid level

C. Services converter

D. Services pump

II. **Automatic transmission continued:**

E. Services clutches

F. Services band

G. Services planetary system

H. Services hydraulic system

I. Performs adjustment

J. Services governor

K. Services modulator

L. Services throttle pressure

III. **Light and body wiring (6 weeks)**

Specific objectives:

To learn to read a wiring diagram
To learn to diagnose wiring problems

A. Reads wiring diagram

B. Diagnoses lights

1. Head and tail

2. Signal

3. Brake

4. Backup

5. Body

C. Diagnoses gauges

D. Diagnoses fuses

E. Diagnoses grounds

IV. **Air conditioning (2 weeks)**

Specific objectives:

Specific objectives continued:

To learn the basics of heat transfer
To learn to replace and repair system components, evacuate and regas

A. Understands heat transfer

B. Uses freon

C. Replaces hoses

D. Detects leaks

E. Tests vacuum pump

F. Tests charging

G. Services dehydrator

COURSE CONTENT FOR AUTO MECHANICS III

(First and Second Semesters)

I. Classroom and work experience (36 weeks)

Specific objectives:

To develop leadership skills by acting as group leaders
To develop diagnostic skills through individual assignments
To gain actual work experience

A. Practices leadership skills

1. Group leader
2. Shop leader
3. Demonstrator
4. Assist other students
5. Pick up parts
6. VICA leadership
7. Maintain toolroom

B. Participates in cooperative work assignments

C. Demonstrates diagnostic skills

1. Diagnoses
2. Emission system
3. Computer systems
4. Tune-up service

RESOURCE MATERIALS

Textbooks

Crouse, William H. Automotive Mechanics 8th Edition. New York, New York: Greg Division/McGraw-Hill Book Company, 1980.

Stockel, Martin W. Auto Service and Repair. South Holiand, Illinois: The Goodheart-Willcox Company, Inc., 1978.

Stockel, Martin W. and Stockel, Martin T. Auto Mechanics Fundamentals. South Holland, Illinois: The Goodheart-Willcox Company, Inc., 1978.

Curriculum Guides

Automotive Mechanics, Trade and Industrial Education. Nashville, Tennessee: Division of Vocational-Technical Education, 1982.

Automotive Mechanics. Stillwater, Oklahoma: Mid-America Vocational Curriculum Consortium, 1980.

Audio Visual

Filmstrips with Cassetts

Bergwall Productions, Inc., Garden City, New York, 5 units each at 15 minutes

Automotive Shop Safety, No. 411

Internal Combustion Engine, No. 405

Troubleshooting, VAT 40, No. 441

Ignition System Explained, No. 401

How To Do a Tune-Up, No. 402

Charging Systems, No. 436

Filmstrips with Cassetts continued:

Major Engine Overall, No. 410

Problems—Engines, No. 409

Automotive Air Conditioner, No. 442

Operation—Fuel System, No. 407

Hydraulic Brake System, No. 404

Metric Measuring Tools Explained, No. 511

Teaching Aids Incorporated: Career Education for Automotive Technology, Costa Mesa, California

Steering Geometry, (AT E-2A)

Master Cylinder Service, (AT F-4A)

Alternator Diode and Stator Testing, (AT M-46B)

Ignition Scope Secondary Waveform, (AT M-55A)

Cooling System Service, (AT J-5A)

Exhaust Emission Control, Air Injection, (AT L-11B)